

NOTES ON THE CONSTRUCTION OF THE NET AND SPERM-WEB OF A CRIBELLATE SPIDER *DINOPIS SUBRUFUS* (KOCH) (ARANEIDA: DINOPIDAE)

by DENSEY CLYNE

(Figures 1-6).

1. NET

Several species of the genus *Dinopis* were described by L. Koch (Die Arachniden des Australiens, 1879) from specimens sent to him by H. B. Bradley, a former trustee of the Australian Museum. These included *Dinopis subrufus*.

This spider is common around Sydney, its habitat being low shrubbery and herbage, and the following observations were made in a garden in Turramurra, 12 miles north of that city, where the spider is abundant throughout the year.

The net is used by males and females from about 4 mm. upward in size for the capture of prey. The female makes it during the whole of her life, the male until his final moult, when he leaves his customary place to go in search of a female. The net, composed of threads of cribellate silk and measuring about 10 mm. x 15 mm. unexpanded, is made by the spider in the early evening.

Emerging at dusk, *Dinopis* moves deliberately around on her long, stick-like legs placing the supporting framework of non-cribellate silk thread. As far as the terrain will allow, these threads always occupy the same relative positions.

Fig. 1 is a diagram of the completed framework. Between points C, D and E there is always a small network of supporting threads; these have been left out for simplicity. Lines H-D and D-I are secured at their outermost points somewhat behind lines F-C and C-G. Similarly, lines J-E and E-K are secured a little behind H-D and D-I.

The framework made, *Dinopis* takes up a position from behind, grasping it with her legs as shown in Fig. 1, where numbers are used to indicate the placing of tarsi 1 and 2. R1 indicates the tarsus of the first right leg, L1 the tarsus of the first left leg, R2 the tarsus of the second right leg and L2 the tarsus of the second left leg. It will be seen that at this stage the spider is suspended *head upward* by her first legs, which grasp line B-C. Her second legs support her also, by grasping respectively lines F-C and C-G. The first and second legs remain in these positions throughout the making of the net.

The third legs change position constantly as the net is made; they are employed to hold, each in turn, the four lines H-D, D-I, J-E and E-K at the junction of which the rectangular net is placed, and to affix to them as required the lengths of cribellate thread which compose it.

The fourth legs are used in the usual way of cribellate spiders to produce the blue-white cribellate silk by rhythmic combing movements of each calamistrum in turn across the cribellum. Under magnification, the silk appears as two wavy parallel lines connected by a series of fuzzy transverse loops.

Placing the tip of her abdomen at point M (Fig. 2) *Dinopis* now starts combing out the first length of cribellate silk. When this length is nearly completed, L3 picks up line E-N about half-way along and takes it towards the spinnerets. The first length now finished, the fourth legs stop combing, L4 takes the line from L3 close to point N, and applies it to the spinnerets to attach the length of silk in place.

Combing immediately recommences; R3 moves to point N; L3 moves to D-O, and at the appropriate moment carries it towards the spinnerets. Combing stops; L4 picks up the line; the new length is attached to it at point O, and now the direction is reversed.

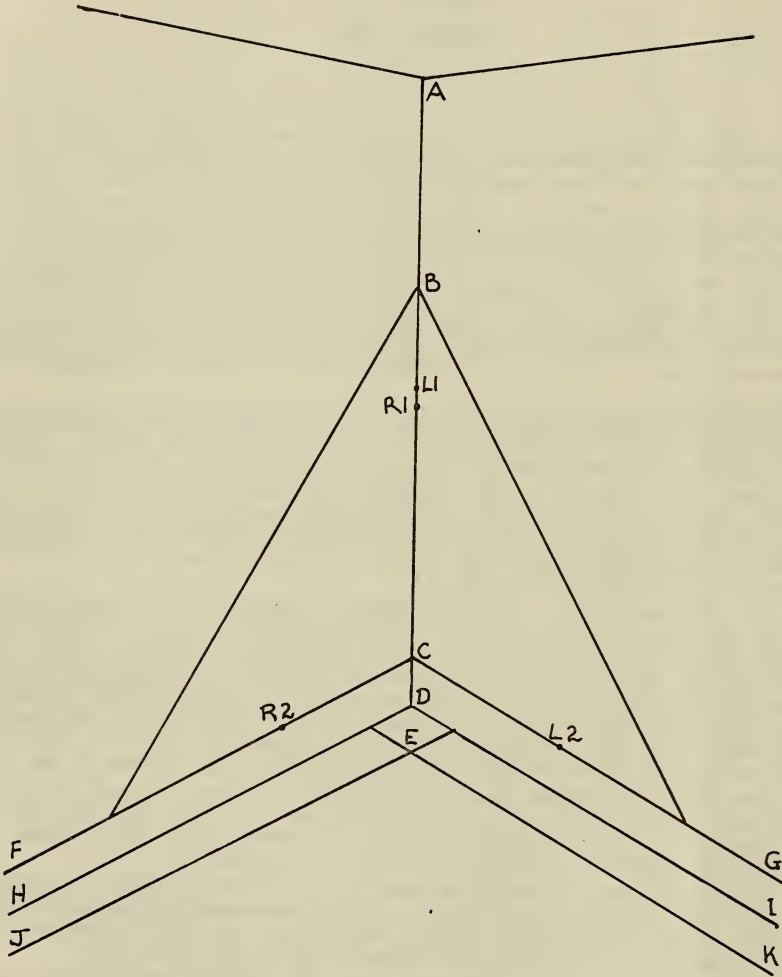


Figure 1.

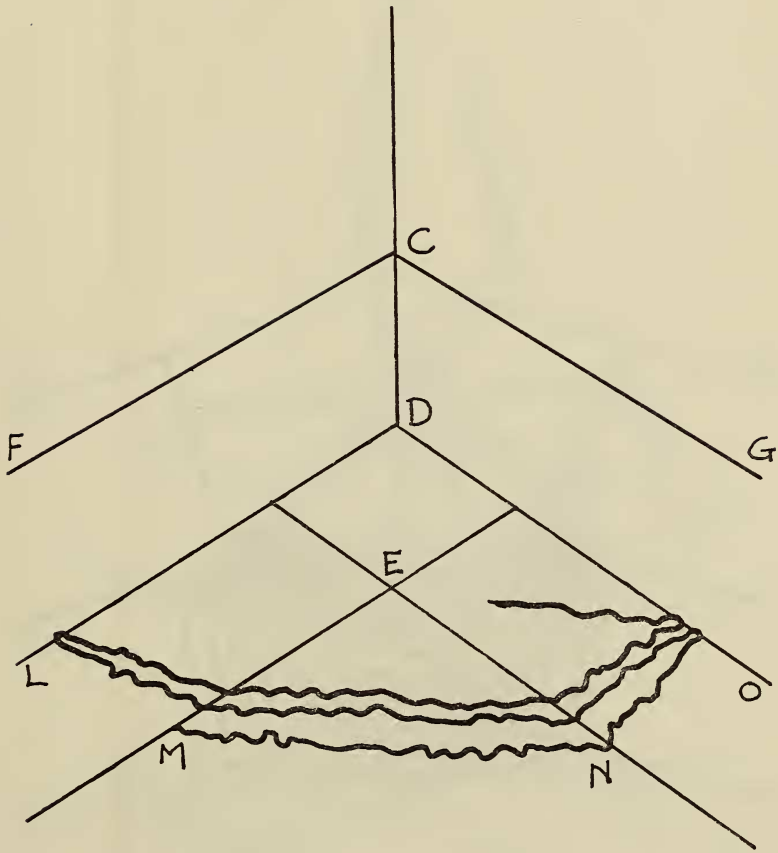


Figure 2.

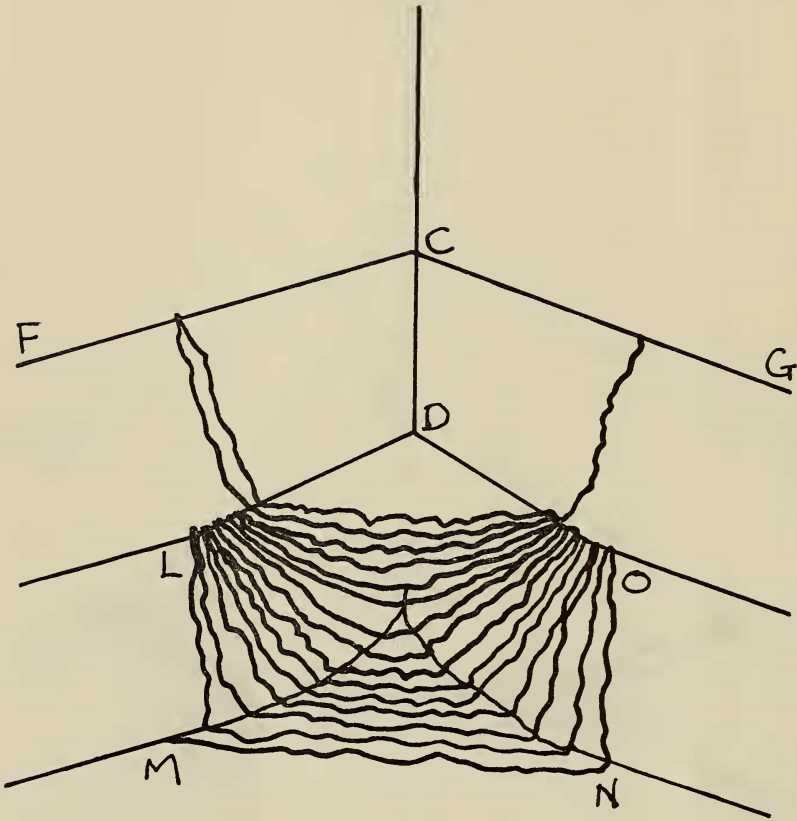


Figure 3.

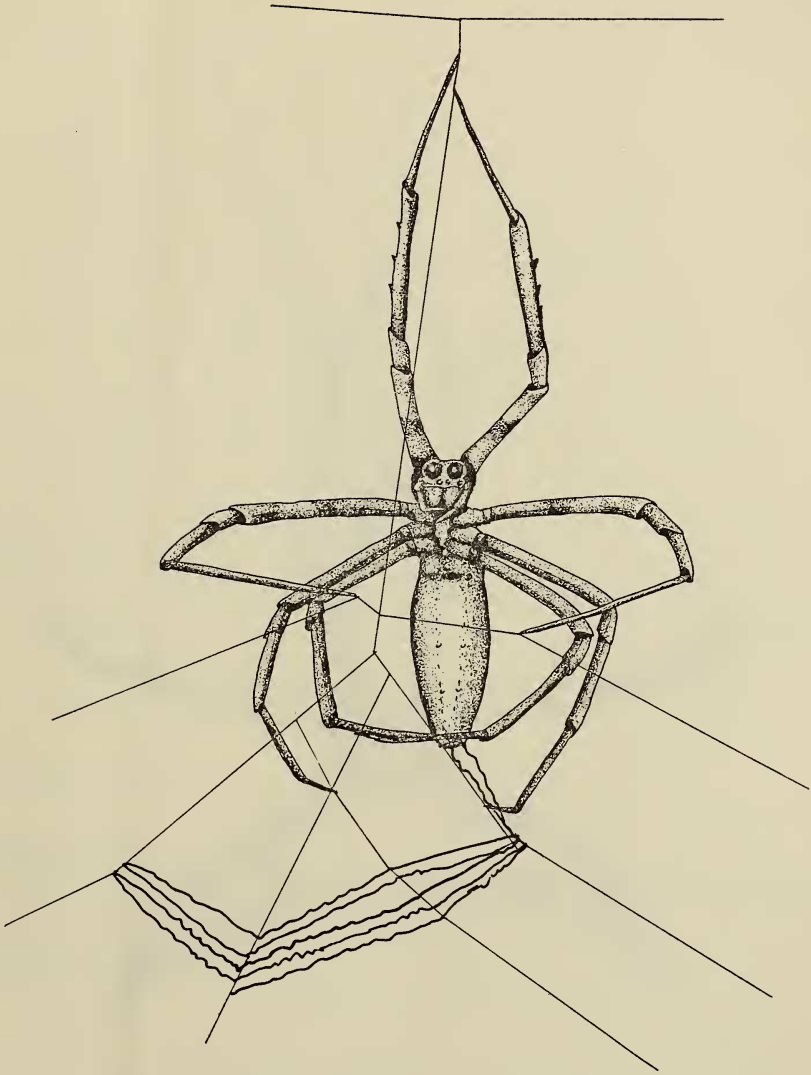


Figure 4.

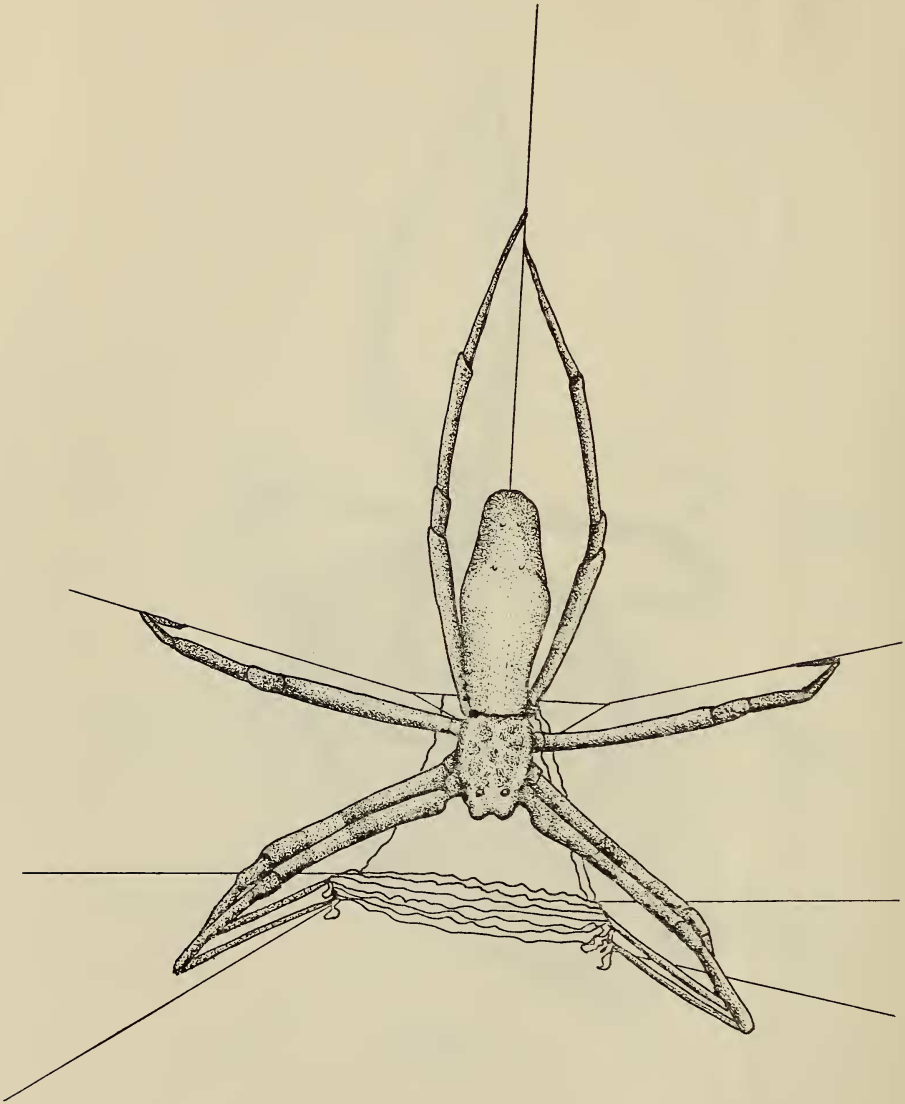


Figure 5.

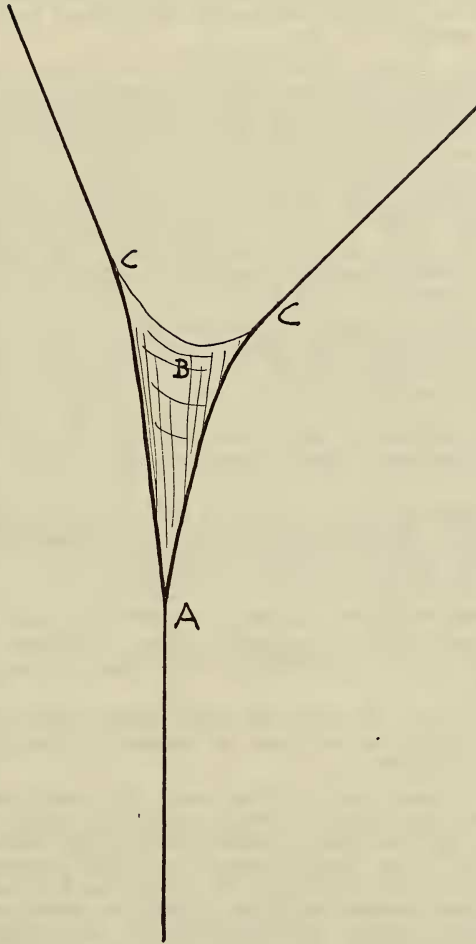


Figure 6.

The next length is combed out and attached this time with the help of R3 and R4 to point N. In whatever direction the spider is working, the leading third leg moves ahead ready to attach the new length, and the trailing third leg follows on to the last point of attachment. (Fig 4).

As this procedure continues, the centre sections of silk grow shorter and shorter as the lines of attachment converge at E. A little before E is reached, *Dinopis* starts to use only two sections of silk to span the required distance, and after it is reached, only one.

Gradually the shape of the structure has altered (Figs. 3 and 4). Probably by appropriate tensioning, the outer lengths of cribellate silk which to begin with were at only a slight angle to the horizontal, have been drawn up until they are almost vertical. The last few single lengths, connecting points L and O directly, put the finishing touches to what has now become a rectangle.

Now the final steps are taken. *Dinopis* combs out another length of silk, but instead of carrying it across to the opposite side of the net, she attaches it directly above its point of commencement on line F-C. Another length is produced, taken downward parallel to this, and attached at the same corner. A third is carried across the top of the rectangle to the opposite corner, and a fourth is taken up to line C-G directly above this corner.

The net is now complete, and *Dinopis* leaves it, to move slowly up to the top of the framework, turn around, and come down head first. On the way she bites through line B-C (Fig. 1) and the observer would expect much of the elaborate structure to fall in a tangle. However, by now the spider is firmly grasping lines F-C and C-G to which the net has just been secured; she herself is suspended by her fourth legs from an independent line still attached to her spinnerets, which hangs vertically behind the line she has just severed.

All that happens on the severance of line B-C is that this, together with the central complex of threads just above the net, collapses, and the net itself drops a little. It is now held in position by:

- (1) lines L-D, D-O and M-N;
- (2) the cribellate threads holding it to lines F-C and C-G; and
- (3) the spider, which is suspended above and behind it, her first two pairs of legs curved forward to hold the four corners in their tarsi (Fig. 5).

It remains only for the net to be tested, which *Dinopis* does by stretching it out once or twice to several times its apparent dimensions. After this the spider remains motionless.

If a suitable insect comes within reach, the spider flings the instantly expanded net over and around it, letting herself drop sufficiently by releasing her fourth tarsi. The two elastic threads attaching the net to lines F-C and C-G allow the net to be carried forward and down without breaking away from the framework, and the spider still grasps the four corners of the net which she then wraps around her victim. If the prey turns out to be large and dangerous, the spider moves away and allows it to struggle free. A second net is sometimes constructed by *Dinopis* while she is still holding her prey in her jaws.

In the daytime, *Dinopis* hides amongst foliage, hanging head down with the legs held together in pairs in the form of a Maltese cross. If no prey has been obtained, the net is left in place during the day, and the spider returns to it at nightfall.

N. L. Roberts (Proc. Roy. Zool. Soc. N.S.W. 1953-4) has timed the construction of the net as varying between 22 and 34 minutes, and my own observations roughly correspond with this. Males at the penultimate stage appear to take a few minutes less than females. I have timed the rate of movement of the calamistrum across the cribellum and spinnerets at approximately

200 strokes (each stroke comprising an upward and a downward motion) per minute.

In the same paper, Mr. Roberts describes how *Dinopis* "eats" the silk of the old structure when making a new one. I have watched the same procedure. The silk is rolled up into a ball, and held and manipulated by the mouthparts while digestive fluid is secreted on to it, the spider often pausing in her work to dispose of a large portion.

2. SPERM-WEB

The male moves from his habitual head-down resting position on vegetation near the female and fixes into place a few silk lines in the form of a narrow Y. Grasping these, and now head upward, he fills in the lower part of the V with a fabric of non-cribellate silk threads.

After placing the first lines across the top of the area to be filled, he moves the tip of his abdomen up and down and sometimes across. When moving downward he places the silk with a series of dabs; when moving upward he lays it smoothly with one motion.

The web takes about five minutes to make and when finished measures approximately 1 cm. long by 5 mm. at the widest part.

The sperm-web completed, the male moves to its opposite face, grasping point A (Fig. 6) with his fourth legs, and points C with his third legs. He dabs his abdomen with an even motion approximately 70 times against the centre of the web at point B. When he moves away a small shining spot is visible to the unaided eye.

The spider now returns to the opposite face of the web, adopting a head-upward position with legs grasping the supporting threads. Now he places his palps alternately over the top of the web and on to the spot of sperm. Each palp is applied about 8 times. The time of induction by each palp varies from 30 seconds at the beginning to 10 seconds towards the end. While one palp is applied, the other is moved slowly up and down.

After sperm induction the spider resumes a head-down position above the sperm-web, which he does not devour or destroy.
